

Coatings
Corrosion
Fracture and Mechanical Testing
High Temperature Mechanical Properties
Hydrogen Production and Storage Materials
Hydrogen Separation Materials
Irradiation
Materials Validation
Microstructure and Physical Properties
Modeling
Neutron Radiography
Nondestructive Evaluation
Post-irradiation Examination
Synthesis and Processing of Novel Materials
Welding and Joining
X-Ray Radiography

Irradiation

Capabilities/Facilities

The Advanced Test Reactor (ATR) is among the most technologically advanced nuclear test reactors in the world. Its unique ability to provide either constant or variable neutron flux during a reactor operating cycle makes irradiation in this reactor very desirable for studying the effects of intense neutron and gamma radiation on reactor materials and fuels. ATR has a maximum power of 250 MW and can provide maximum thermal neutron fluxes of 1×10^{15} neutrons/cm²s.

Materials

Nuclear fuels and structural materials.

Scientific/Engineering Issues

ATR allows considerable acceleration of accumulated neutron fluence to materials and fuels over what would be seen in a typical power reactor. For simple experiments, test specimens may be placed in an uninstrumented sealed capsule with no real-time monitoring or control. More sophisticated testing facilities have inert gas temperature control systems and pressurized water loops with continuous chemistry, pressure, temperature and flow control, as well as numerous test specimen monitoring capabilities. Reactor transients can also be simulated on test specimens.

The Irradiation Test Vehicle accommodates up to fifteen separate tests, each with its own temperature control and monitoring as well as neutron spectral tailoring capability.

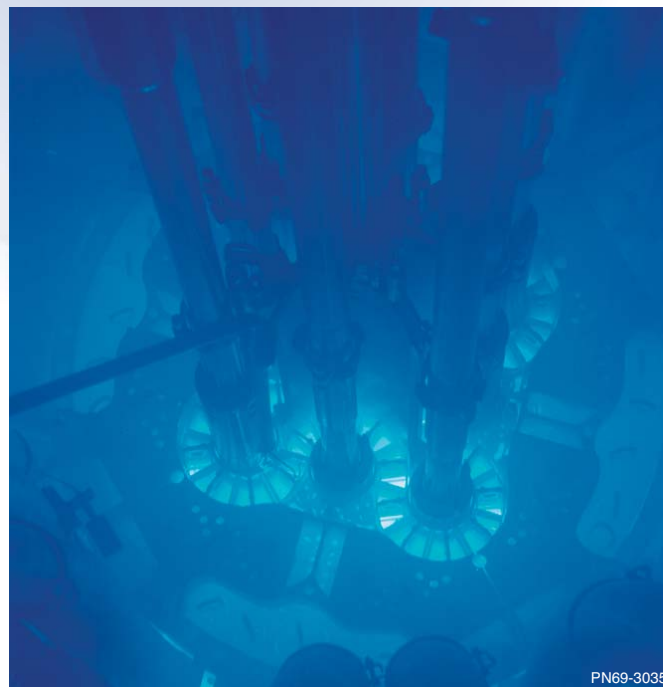
Staff

R.V. Furstenau and S.B. Grover. Extensive operations, maintenance, engineering and experimental support staff.

Recent Projects

ATR is used primarily by DOE's Naval Nuclear Propulsion Program. Since the early 1990s, about one-third of ATR's test space has been made available for other research programs. A few of the irradiation programs successfully completed in the ATR are listed below.

- Space reactor materials and coolants (LiH SP-100)
- Mixed oxide fuel irradiations
- Modular high temperature gas cooled reactor testing (New Production Reactor)
- Tensile, charpy, creep, zircaloy growth materials testing
- Pu-238 production feasibility
- Fusion insulator materials
- Reduced Enrichment Research & Test Reactor fuel testing
- Production of numerous medical, industrial, and research radioisotopes.



PN69-3035

The ATR at the Test Reactor Area is widely considered to be the nation's premiere test reactor. This photo looks down into the reactor core.

Continued on back

Science

INL
Idaho National
Laboratory

Continued from front

Publications

“Operating the Advanced Test Reactor in Today’s Economic and Regulatory Environment,” R.V. Furstenuau, M. Patrick and D.C. Mecham, *Proceedings of the Sixth Asian Symposium on Research Reactors*, March 1999, published August 1999, JAERI-Conference 99-006.

“The Advanced Test Reactor’s Role in Nuclear Power for the 21st Century,” R.V. Furstenuau, D.L. Batt and D.C. Mecham, *Transactions of the 15th International Conference on Structural Mechanics in Reactor Technology (SMiRT 15)*, August 2000.

“Temperature Controlled Material Irradiation in the Advanced Test Reactor,” F.W. Ingram, A.J. Palmer and D.J. Stites, *The International Conference on Fusion Reactor Materials #8*, Sendai, Japan, October 1997.

“Installation of the Irradiation Test Vehicle in the Advanced Test Reactor,” A.J. Palmer, B.C. Hong and F.W. Ingram, *9th International Conference on Fusion Reactor Material*, Colorado Springs, CO, October 1999.

“Materials and Fuels Testing in the Advanced Test Reactor – From Simple to Complex,” R.V. Furstenuau, F.W. Ingram, J.E. Brasier and M.B. Hendrickson, *Transactions of the 16th International Conference on Structural Mechanics in Reactor Technology (SMiRT 16)*, August 2001.

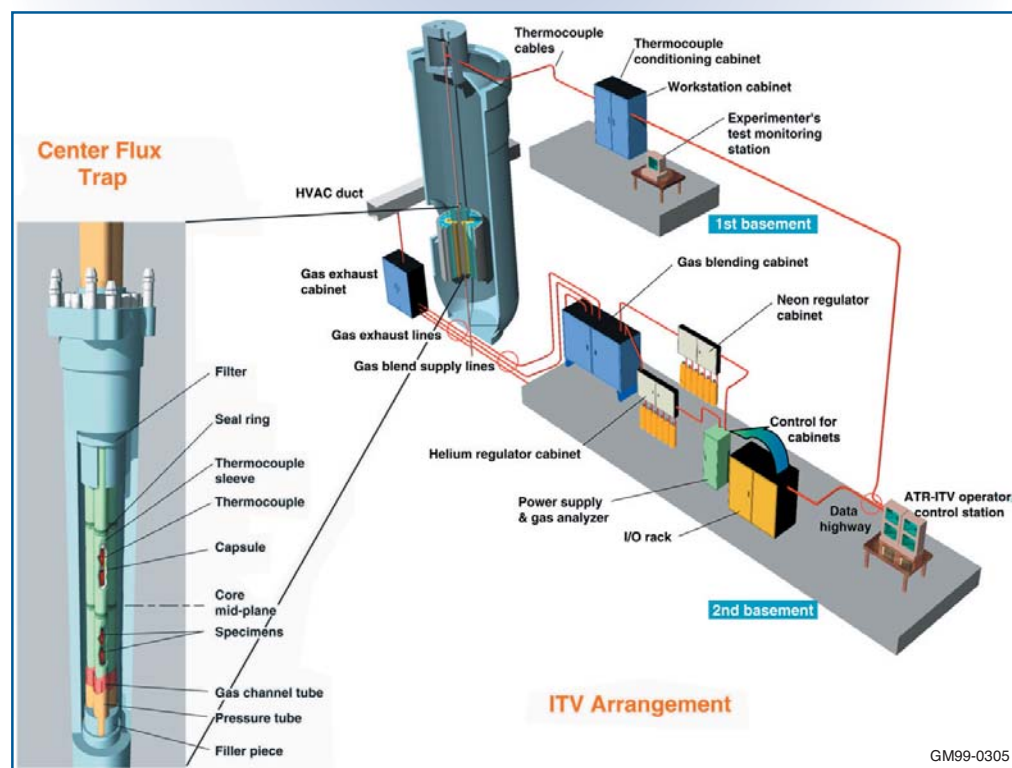
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Irradiation Test Vehicle Arrangement